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Research Note

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FACTORS THAT AFFECT CHOICE OF SHELVING MATERIALS IN SINGLE-FAMILY HOMES

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CURRENT SERIAL RECORDS

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ABSTRACT

Survey of homebuilders shows that lumber is predominant material used for shelving in single-family homes but builders have considerable interest in other materials such as particleboard and metal in order to eliminate warp and reduce installation and finishing costs.

Lumber has traditionally been the most common material used for shelving, but in recent years several alternate materials have been developed or adopted as substitutes. These include particleboard and plywood, which use wood in different form, and metal, which directly competes with wood.

Particleboard utilizes wood residues, species, and grades that are often difficult to market profitably as lumber. Low grade boards overlaid with plastic, paper, or similar material might yield a higher profit margin when sold for shelving than it would when sold as commodity lumber. Residential construction alone represents a potential annual market of over 100 million board feet for shelving material; this is based on 1.5 million housing starts.

The purpose of this study is to identify variations in use of shelving materials, to determine criteria builders use in selecting shelving, and to evaluate how well wood products measure up to those criteria. It is based on personal interviews with 136 builders located in 20 cities throughout the Nation, and includes shelving installed in 9,146 homes built either during 1965 or 1966. Shelving purchased as part of units, such as kitchen cabinets or bathroom vanities that were built off the site, are not included.

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[1] Respectively, Associate Market Analyst and Research Forester, stationed at Forestry Sciences Laboratory, Missoula, Montana.

MATERIALS USED FOR SHELVING

Lumber accounted for most shelving installed by builders interviewed, although materials vary among specific applications (table 1). Lumber predominates in all applications, but plywood is sometimes used for wider shelves in linen and storage closets.

Ponderosa pine and white pine accounted for most lumber shelving, although builders in several southern cities often used southern pine, while hardwood lumber was occasionally used for bookshelves.

Particleboard was used more often by large volume builders: about 33 percent of those who built over 50 houses per year used particleboard as compared with only 5 percent of those who built under 50 houses.

Table 1.--Shelving materials used in single-family homes

Material	Bedroom and coat closets	Linen and storage closets	Kitchen[1]	Book shelves	Garage & utility
	Percent[2]				
Lumber	57	47	58	66	43
Particleboard	34	34	37	21	31
Plywood	1	11	4	3	5
Metal	8	8	1	10	21

[1] Does not include shelving in factory-built cabinet units.
[2] Based on material used by each builder weighted by number of houses he built.

RANKING OF FACTORS INVOLVED IN SELECTION OF MATERIAL

Builders consider a number of different criteria when they select shelving materials, and these factors are not rated equally important by all. Builders ranked these as follows:

	Most important (Percent)	Second most important (Percent)
Purchase price of shelving	37	15
Stability and durability	19	15
Installation and finishing	13	19
Home buyers' preferences	10	6
Width and length requirements	10	7
Other factors	11	9

Among builders who use lumber for shelving, the most important factors are (1) price, and (2) stability-durability. However, users of metal shelving ranked installation and finishing as most important; users of particleboard rated stability well ahead of other factors; and plywood users considered width requirements as the key factor.

COST COMPARISON OF MATERIALS

Purchase price of shelving ranged from as little as 9 cents per foot for southern pine lumber to over $1 per foot for some prefinished metal shelving.[2] The average purchase prices for shelving materials follow:

	Average purchase price ($/sq.ft.)
Lumber--select and No. 1 and No. 2 common ponderosa and white pine	0.21
Lumber--all other	.14
Particleboard	.22
Plywood	.19
Metal, prefinished	.82

Total installed costs for shelving also vary considerably, ranging from $0.18 per foot to over $3 per foot. Cost information on installing metal, plywood, or particleboard was too limited, however, to make any meaningful analysis of total cost for these materials. Many builders indicated they considered costs of installing and finishing shelves as part of the total closet cost; they did not have data on installation costs, only on price of material.

BUILDERS' COMMENTS ON MATERIALS

Lumber.--Major advantages reported on lumber are workability and ease of installation. Carpenters are familiar with lumber, and cutting and fitting is simple. Some builders feel that having to paint shelving is a disadvantage, but they consider lumber an easy material to paint or stain. Usually no separate edging strip is required on lumber since it has a smooth edge. On long shelves, however, some builders use a 1- by 2-inch strip of lumber to reduce sagging. Some apply a pattern moulding for appearance.

Installation and finishing costs for lumber shelving were not available from all builders, but the average cost reported was about 27 cents per foot for installing and about 15 cents per foot for finishing. These costs varied considerably. Builders who used higher grades of lumber (selects and No. 1 and No. 2 commons) reported costs averaged 38 cents for installing and 21 cents per foot for finishing as compared with average costs of 14 cents for installing and 9 cents for finishing among builders using No. 3 common and unspecified species and grades of lumber. No specific reasons for these differences were cited but builders who went to the extra expense of using high grade lumber probably put more effort into fitting and finishing. The average cost for lumber shelving is summarized:

	Select and No. 1 and No. 2 common pine ($/sq.ft.)	No. 3 common pine and unspecified grades and species ($/sq.ft.)	All Lumber ($/sq.ft.)
Purchase price	0.21	0.14	0.18
Installing	.38	.14	.27
Finishing	.21	.09	.15
Total	.80	.37	.60

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[2] Most lumber shelving is nominally 12 inches wide; therefore, square foot and board foot are used synonymously in this report.

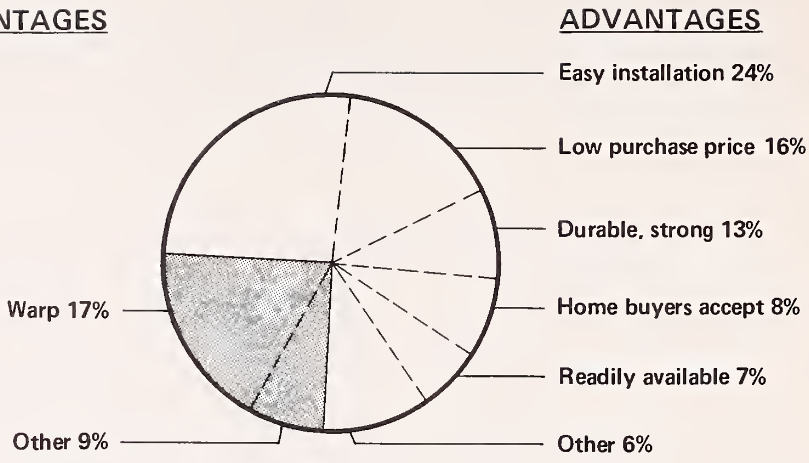

Figure 1.--Builders' comments on lumber shelving.

Many builders indicated that, aside from the actual physical properties of lumber, the image of strength and solidness is a factor in home buyers' acceptance of lumber shelving. Even when knots are visible, some buyers prefer "solid" lumber to an "imitation" material.

Two other factors also favor lumber: (1) it is readily available, and (2) it has many uses on building sites.

The major problem with lumber is warping. Even when lumber is nailed down, it has a tendency to warp. Warping poses even greater problems for those builders who prefer to install shelving "loose lay" so it can be removed easily for cleaning. Some other disadvantages reported are (1) that two boards are required for shelves wider than 12 inches, and (2) that torn grain, knots, and splits make it difficult to get a smooth-finished surface on lumber shelving. Builders' comments on lumber shelving are summarized in figure 1.

Particleboard.--This material has been accepted for shelving because it is comparable to lumber in price and workability and superior to lumber in terms of warping. It is considered easy to cut, fit, and install, and some builders feel that the absence of knots and splits makes it easier to use than lumber.

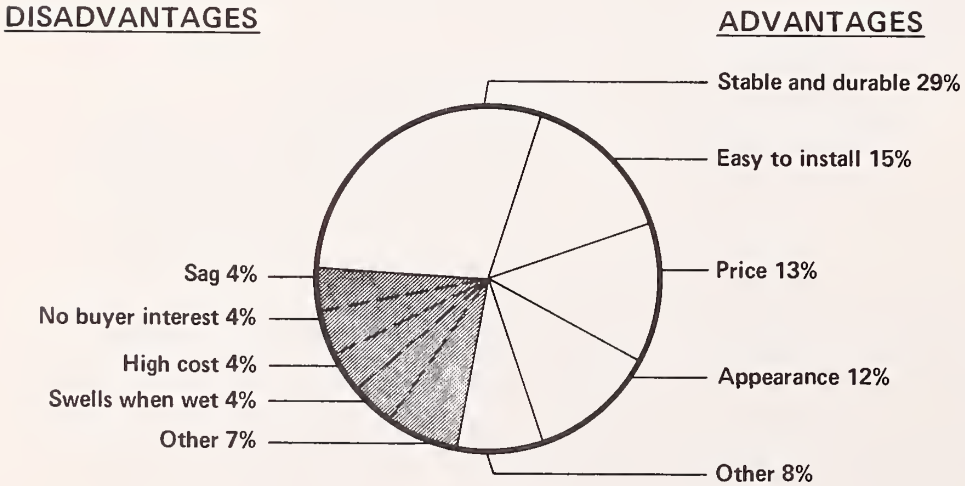

Figure 2.--Builders' comments on particleboard shelving.

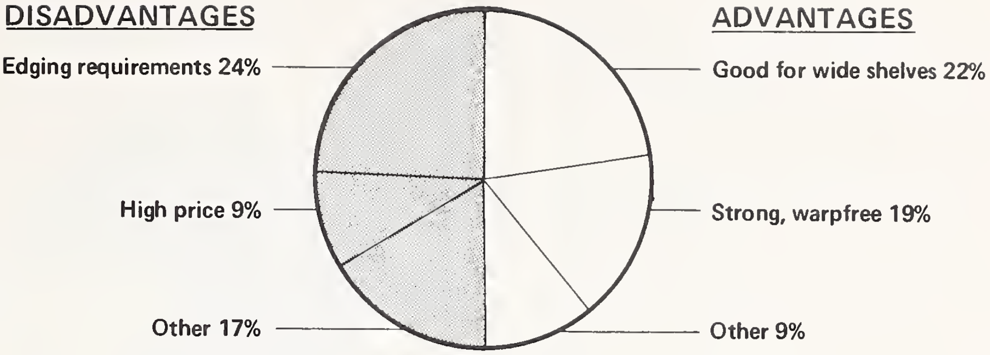

Figure 3.--Builders' comments on plywood shelving.

Some builders realize a cost saving in using particleboard because they do not apply a finish on this material. Those who do finish particleboard indicate that it paints or stains readily and presents a good appearance. An additional saving in labor was reported by some builders who use a particleboard with round nosing machined on at the factory or by their supplier. This eliminates the need for edging on the site. However, some builders feel an edging strip is needed to stiffen the particleboard shelving for long spans. Builders' comments on particleboard shelving are summarized in figure 2.

Plywood.--A major advantage of plywood is that a single piece of material can be used for shelves wider than 12 inches. Plywood is used for shelving mostly in linen and storage closets where 18- and 24-inch widths are common. Another advantage is that plywood is less subject to warp. Also, a few builders believe it is stiffer than lumber; therefore, it can be used for longer spans.

The chief drawback of plywood is that an edging strip is usually required to cover rough edges and voids in the inner plies. Some builders complained that the plies split when the edging strip is nailed. Several also stated that plywood surfaces are rough; therefore, they are more difficult to finish.

The average purchase price of plywood is about the same or less than that for higher grades of lumber. However, builders who use low grade lumber consider plywood expensive by comparison. Not enough data on installing and finishing costs for plywood were obtained to permit us to make a cost comparison with lumber. A few builders commented that the average installed costs for plywood and lumber shelving are about the same. Builders' comments on plywood shelving are summarized in figure 3.

Metal.--Builders' comments generally were more unfavorable than favorable with regard to metal shelving. However, metal has two major advantages over wood shelving. Installation is simplified in that metal shelves can be purchased ready to fasten into place; thus no cutting or finishing is required. In addition, metal shelves are warp-free.

The principal disadvantage is that metal shelves are not readily accepted by buyers. Builders reported that buyers feel metal shelves have a "tinny" look that does not give an image of being strong and solid. In addition, some report that metal shelves rattle when closet doors are closed unless the shelf has enough of a load on it to prevent vibration.

Another drawback is that metal shelving costs more. Builders usually do not keep detailed records of their shelving installation costs; therefore, they are more aware of the difference in purchase price between metal shelving and lumber. Moreover, prices for different quality metal shelves vary widely. Builders' comments on metal shelving are summarized in figure 4.

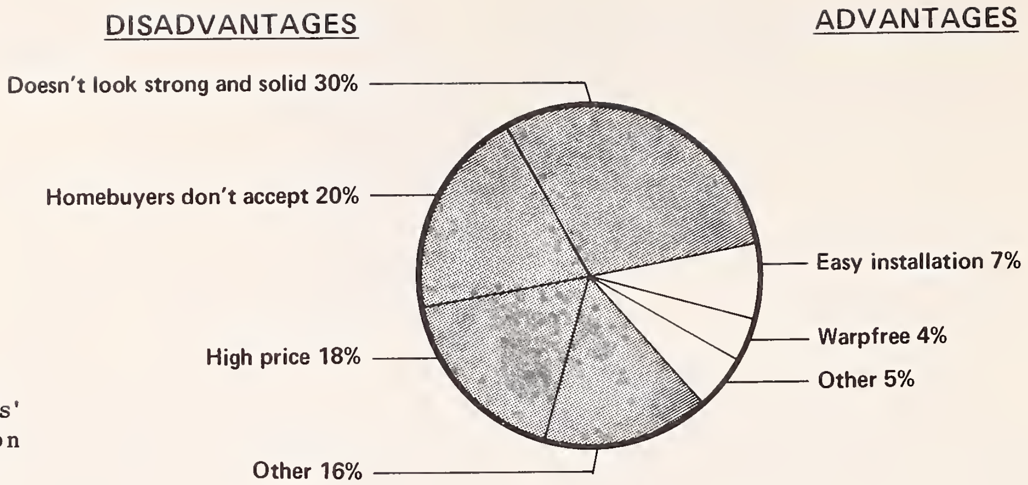

Figure 4.--Builders' comments on metal shelving.

CONCLUSIONS

Builders are interested in new shelving materials. Some have already changed from lumber to plywood, particleboard, or metal for some or all of the shelves they install. Others are seeking information on new products that might have better performance properties than lumber or that might reduce labor costs for installing and finishing.

Performance improvements suggested by this study are to overcome problems of warping, sagging, and surface defects. Particleboard is an example of an improved shelving material in that it is warpfree and has a smooth uniform surface.

Potential cost savings cited by builders would be to reduce or eliminate the time and labor needed for cutting, installing, and finishing shelving materials. Metal shelving offers one approach to such cost savings through a shelving "package"; that is, metal shelves are manufactured to size, prefinished, and the package includes all the necessary accessories and hardware for installation.

Conceivably the concept of a "package" system for cost saving might be extended to the entire closet. Many builders do not think in terms of shelving costs alone but rather in terms of total costs for closet or storage areas, and some feel that the cost of building closets is high relative to the low interest home buyers have in closets.

Perhaps the greatest obstacle to successful marketing of new shelving products is the fact that builders now tend to use purchase price of the material as the basis for comparing shelving cost. Lumber, which is low in cost, is often used as the "measuring stick." Therefore, to be successfully marketed, improved shelving products or shelving systems would have to offer a definite cost saving to the builder.

FOREST SERVICE CREED

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